Studies on Costa Rican Odonata.

IX. Sympetrum, with Description of a New Species.

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The only *Sympetrum* recorded from Costa Rica in the *Biologia Centrali-Americana* is *S. illotum virgula*, specimens of which were examined from San José, San Francisco and from an altitude of 6000–7000 feet on Irazú. Dr. Ris, in the *Catalogue, Collections Zoologiques . . . Selys** and in his *Libellen (Odonata) aus der Region der amerikanischen Kordilleren von Costarica bis Catamarca,*† has neither added any Costa Rican data for this form nor increased the number of species of *Sympetrum* from that country.

In the course of the year May 1, 1909,–May 10, 1910, we observed *Sympetrum illotum* in Costa Rica at Cachí, Paraiso, Cartago and vicinity, Laguna Ochomogo, on the mountain Carpintera, near Tres Rios and at Alajuela. These seven localities represent a range in altitude from 985 to 1600 meters (3230–5250 feet).‡ For the vicinity of Cartago, including San Isidro del Tejar, our notebooks record its appearance in every month except December and January (during the latter of which we were absent except for short visits by one of us), transformation to the imago on September 20, October 30, 31, November 12, 21, 29, and oviposition

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*Fasc. XIII. Libellulinen, p. 677, Bruxelles, 1911.

†Archiv f. Naturges. 82 Jahrg., Abt. A, 9 Heft., p. 180. Berlin, 1918.

‡Details as to altitudes, localities, etc will be found in "A Year of Costa Rican Natural History" by A. S. and P. P. Calvert, New York, Macmillan, 1917.

I have also one male, intermediate between *i. illotum* and *i. virgula*, sent by Mr. C. H. Lankester with specimens taken near the Rio Jesus Maria, on the Pacific slope, April 2–4, 1918. The altitude of this locality, less than 100 meters, is much below that in which this species has been observed elsewhere in Central America or Mexico. The specimen has been submitted to Mr. Lankester, who writes that it "conveys no memory of capture." The envelope in which it was originally sent to me is part of a printed page, another piece of which contained an *Erythrodiplax connata* whose occurrence at Rio Jesus Maria there is no reason to doubt.

on May 10, June 20, August 28, September 26, October 7, 11, 31, November 12, 21, April 5, 20. Specimens are not at hand for all the dates on which the species was noted, so that it is impossible to specify which subspecies was the form seen at each observation. Those which are accessible, irrespective of locality, are chiefly of the subspecies *illotum virgula*, or intermediates between *i. virgula* and *i. gilvum*, as these are defined in the *Biologia*, volume *Neuroptera*. There are before the writer 1 ♂ *i. virgula* and 2 ♀ intermediate between *i. virgula* and *i. gilvum*, all three taken at Cartago, May 10, 1909, over the same swampy place. Two males taken just above Cartago, May 24, 1909, are respectively intermediate between *i. illotum* and *i. virgula* and between *i. virgula* and *i. gilvum*. It seems unlikely, therefore, that the exact form of the species has any strict correlation with the habitat.

In Costa Rica we found this species in open swamps and open fields, at small pools (as in lanes at Cartago), on the banks of the Rio Reventazon (at Cachí), at a tank in a coffee plantation (Cachí). As in other species of this genus, the male and female fly around together while the latter is ovipositing, the male holding the female's head with his abdominal appendages.*

The occurrence of this species at a given station is erratic. Thus on the southern edge of the town of Cartago:

"The day . . . . was May 10, 1909. The rains of the two preceding days had changed the dusty roads to damp and produced little swampy spots in the pastures. Over one of these swamps a species of dragonfly (*Sympetrum illotum virgulum*) was swarming . . . . There was an exceedingly handsome frog here (*Agalychnis helenae*) . . The morning of May 11 was not so bright as that of the preceding day,

*Dr. C. H. Kennedy states that in California "Usually the female of this species oviposits unaccompanied by the male but here [Auburn in Placer County] I observed a pair working together." Proc. U. S. Nat. Mus. vol. 52, p. 609, 1917.

On all of the eleven dates mentioned above for oviposition in the vicinity of Cartago and also at Laguna Ochomogo on Sept. 25, our field note books expressly record that male and female were flying together, the male holding the female. We have no record of oviposition in any other way.

although the sun was shining. We revisited these same swampy spots but not a single individual of the bright red species of dragonfly nor one of the peculiar frogs was to be seen there . . . "†

On March 4, 1910, this species was at a tank in a coffee plantation at Cachí and on March 5, by stagnant pools near the bank of the Rio Reventazon near Cachí; on March 9 and 10 it was not found at these two places respectively although the days were sunny.

The dates at which this species was observed at localities other than the vicinity of Cartago and Cachí were: September 25, Laguna Ochomogo; December 4, La Carpintera; December 9, Alajuela and vicinity; March 17, east of Tres Rios.

On April 21, 1916, Professor Anastasio Alfaro, Director of the Museo Nacional de Costa at San José, who has done so much to advance scientific knowledge of that country, collected some *Sympetra* on the Volcano Poas. These at first sight appeared to be intermediate between *S. illotum virgula* and *S. illotum gilvum*, but a detailed study apparently justifies their recognition as a distinct species for which I propose the name

Sympetrum nigrocreatum n. sp.

Similar to *S. illotum virgula* Selys but differing as follows: Size larger. Range of length of abdomen ♂, 26–28 mm. (22–25*), ♀, 26–28 (21–23); average ♂ 27.045 (23.33), ♀ 27.14 (22.6) mm. Range of length of hind wing ♂ 30–33 (26–29), ♀ 31–34 (27–30); average ♂ 31.72 (27.41), ♀ 32.35 (28) mm.

No additional transverse carina on abdominal segment 4 in ♂, except in one ♂ in which it is low but distinct (present, distinct), but present in the ♀ (present, distinct).

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†A Year of Costa Rican Nat. Hist., pp. 73,74.

*The figures and other statements enclosed in parentheses in this description are those obtained from 12 ♂, 5 ♀ of *S. illotum virgula* and intermediates between it and *S. illotum illotum* on one hand and *S. illotum gibrum* on the other, from the seven Costa Rican localities mentioned on page 249. They are given immediately after the corresponding figures for *S. nigrocreatum* which latter are based on 11 ♂, 7 ♀. Where percentages of variation are given, as for venational characters, each wing, fore or hind, = 2.777 % for *nigrocreatum* and 2.941 % for *S. illotum virgula* and intermediates.

Apices of the femora and all of the tibiae and of the tarsi blackish brown (femora and tibiae luteous or reddish); some tendency toward paling of the legs is shown by one male which has all the tibiae with a superior luteous stripe, two males which have the third tibiae somewhat reddish superiorly and one female which has all the tibiae reddish.

Venation, especially near the front margin of both front and hind wings blackish brown (luteous or reddish except in three ♀).

Yellow coloring at the base of the wings reaching on the front pair to the first antenodal, less frequently to the arculus (most frequently to the level of the triangle), on the hind pair to the second, rarely the third, antenodal (to the nodus, less frequently to the second antenodal or triangle and then a nodal yellow spot is present); no yellowish spot at nodus of front wings (present). Dark brown streak at base of wing in subcostal and partly in costal area reaching distad on the front wings to one-third or one-half way to the first antenodal (one-fourth way or less to the first antenodal), on the hind wings to the arculus or, less frequently stopping at a point half-way from first antenodal to arculus (first antenodal, less often to arculus). Dark brown basal streak in cubital area of hind wings varying from a mere trace to reaching almost to the cubito-anal cross-vein or anal crossing.

Pterostigma uniformly luteous or even golden yellow, not paler at its distal end (luteous or ochre brown, paler at the distal end, but golden yellow in 1 ♂, 1 ♀, and not paler at distal end in 3 ♂, 3 ♀), longer, 2.66–3.26 ♂ (2.33–2.74), average 2.92 (2.51), 2.81–3.18 ♀ (2.52–2.81), average 2.97 (2.63) mm.*

Antenodals, front wing, 8½ 2.77%, 9½ 36.1%, 10 2.77%, 10½ 44.43%, 11½ 5.55%, the remaining 8.32% somewhat irregular (7½ 8.82%, 8½ 79.38%, 9½ 5.88%, 8½ 5.88%); hind wing 6 22.17%, 7 72.2%, 8 5.55% (5 + ½ 5.88%, 6 91.14%, 6½ 2.94%). Two rows of cells between *M2* and *Rs* on the front wings begin at the following distances from the margin and extend thence distad: 2 cells 2.77%, 3 cells 8.33%, 4 cells 33.33%, 5 cells 33.33%, 6 cells 16.67%, 7 and 9 cells each 2.77%† (2 cells 41.16%, 3 cells 23.52%, 4 cells 5.88%, while 29.4% have but one row of cells here); marginal cells here 2 25%, 3 61.1%, 4 13.88% (1 5.88%, 2 82.4%, 3 11.76 %). Two rows of cells between *M2* and *Rs* on the hind wings begin at following distances from the margin and extend thence distad: 3 cells 22.21%, 4 cells 41.66%, 5 cells 27.77%, 6 cells 2.77% (2 cells 58.8%, 3 cells 8.82%, while 29.4% have but one row of cells here); marginal cells here 2 11.10%, 3 69.43%, 4 11.1%, 5 2.77% (2 88.2%, 3 11.76%).

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*The measurements for the length of the pterostigma and for the superior and inferior appendages of the ♂ were made with an eye-piece micrometer in a Zeiss binocular microscope fitted with eyepieces 4, paired objectives F 55.

†Portions of the hind margin of two wings have been injured, = 5.55 %.

Double cells between *Rs* and *Rspl*, front wings, 0 11.11%, 1 11.11%, 2 22.22%, 3 22.22%, 4 30.54%, 5 2.77% (0 97.03%, 1 2.94%); hind wings 0 36.11%, 1 19.44%, 2 16.66%, 3 13.88%, 4 13.88% (0 100%). Marginal cells between *Rs* and *M*3, front wings, 17 13.88%, 18 22.21%, 19 30.54%, 20 16.66%, 21 2.77%, 22 8.33% (13 5.88%, 14 14.7%, 15 5.88%, 16 47.05%, 17 20.58%, 18 5.88%). Marginal cells between *M*4 and *Cu*1, front wings, 4 36.1%, 5 36.1%, 6 13.88%, 7 8.33%, (2 5.88%, 3 52.94%, 4 38.23%, 5 2.94%).

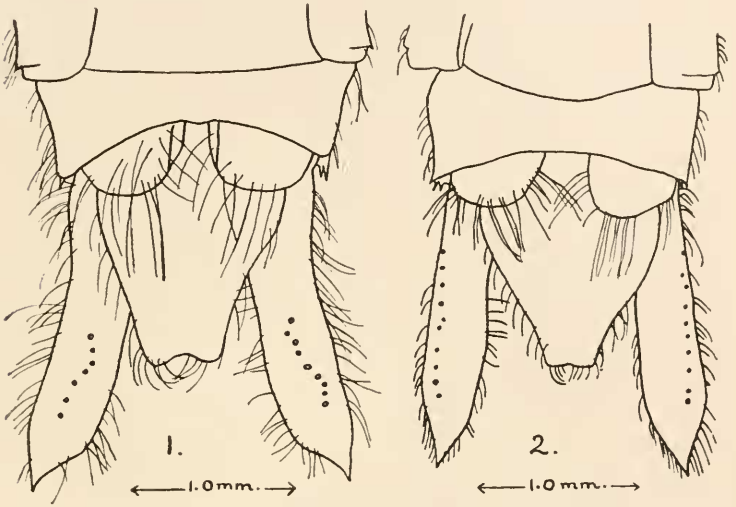

Fig. 1. Ventral view, apex of abdomen *S. nigrocreatum*, ♂, no. 5, Volcan Poas, alt. 2500 m., April 21, 1916, A. Alfaro. Camera lucida, card at stage level, Zeiss stand, comp. micros. oc. 2, obj. A, lower lens off.

Fig. 2. Ventral view, apex of abdomen *S. illotum* intermediate between subspp. *virgula* and *gilvum*, ♂, no. 53, Cartago, February 19, 1910, Calvert. Same lens and camera lucida outfit.

♂. Inferior denticles of the superior appendages, viewed from below, tending to form a reversed curve as shown in text figure 1 (line of denticles almost straight, see fig. 2) and occupying .28–.416, average .353 (.409–.532, average .461) of the total length of the appendage as measured in profile.

Inferior appendage .89–1.11 mm. (.89–1.04) wide at base, average 1 mm. (.96), .30–.44 mm. (.22–.30) wide at apex, average .37 (.28) mm. Ratio of apex width to base width .333–.435 (.229–.337), average .368 (.295).

Locality. Poas Volcano, Costa Rica, 2600 metres [8530 feet], April 21, 1916, by Professor A. Alfaro. 12 ♂, 8 ♀

sent for examination, 1 ♂, 1 ♀ returned to him. *Type* ♂ in the writer's collection at the Academy of Natural Sciences of Philadelphia. As to the type locality Professor Alfaro wrote, July 22, 1916:

"Durante la semana santa estuve en el Volcan de Poas y colectado muchas libéllulas en el Potrero del Alto, cerca del crater; alli hay un Hotel y junto a los desagües de la casa me pareció distinguir tres especies, lo mismo que en la zanja del Potrero; la especie de mayor tamaño no dejaba arrimarse y de la tercera solamente un ejemplar vi; creo pues que mis ejemplares colectados en numero de 40 son ♂ y ♀ de una sola especie . . . las libéllulas del Volcan de Poas, por ser esa la mayor altura en que he colectado Odonatos: 2600 metros."

Mr. E. B. Williamson, at my request, has examined a pair of these specimens collected by Prof. Alfaro and independent of any suggestion from me has also reached the conclusion that they represent a new species allied to *Sympetrum virgula*.

Several features of *S. nigrocreatum* described above are of special interest. According to Dr. Ris,* but three species of *Sympetrum* possess an additional, or supplementary, transverse carina on abdominal segment 4: *dilatatum* Calvert of St. Helena, *illotum* Hagen and *corruptum* Hagen of (chiefly North) America. *S. nigrocreatum* is clearly closely related to *illotum*, yet the male, in the majority of specimens examined, lacks this carina, although the female possesses it distinctly developed. In the male, the appearance is as if the carina had been smoothed out, its site being indicated by a slight difference in the surface of the segment. Whether the presence or absence of such transverse carinae has any correlation with the internal anatomy has not been determined, apparently.

Assuming that *S. illotum* is the nearest ally of *S. nigrocreatum*, the latter is larger and has a greater number of cross-veins (e. g. antenodals) and of cells on its wings. As *nigrocreatum* inhabits a higher, and presumably cooler, station than does the Costa Rican *illotum*, a causal relation is

*Libellulinen Monographisch bearbeitet. Cat. Coll. Zool. Selys, fasc. XIII, pp. 617–624, 1911.

suggested when similar conditions existing in highland and lower land individuals of *Ischnura ramburi* and *I. denticollis** are recalled. Similarly individuals of *Erythrodiplax berenice* from the northern Atlantic coast of the United States are larger and more densely veined than those of the coasts of Florida, the West Indies and Central America.† The question needs much further investigation to determine whether a presumably lower temperature is a cause of larger size and denser venation. If this be so, one would expect individuals of *S. illotum* from British Columbia and the northwestern United States to exceed those of corresponding or lower altitudes in Mexico for example. It is to be hoped that some one with sufficient material will study it from this point of view. A number of the venational features of *nigrocreatum* given above are not in themselves sufficiently diagnostic to distinguish this form from *illotum* and its subspecies. They do, however, show the tendency to vary away from the conditions to be found in *illotum*.

A New Kricogonia from Cuba (Lep., Rhop.)

By Chas. T. Ramsden, Guantanamo, Cuba.

While on a recent visit to the Academy of Natural Sciences of Philadelphia, Dr. Henry Skinner generously called my attention to specimens of *Kricogonia* from Guantanamo, Cuba, I had sent him some years before. These differ so much from individuals of other localities that they seem to belong to a new form and may be known as:

Kricogonia cabrerai n. sp.

♂ *Upperside.* Primaries: Yellowish white; costa from insertion of wing to one-quarter of its length is lemon yellow, the remainder slightly tinged with yellowish.

Secondaries: Same colour as primaries except for a black band 8 mm. long and 3 mm. wide which begins at the costa running toward end of

*Biol. Centr.-Amer., Neur., pp. 387–389, 1907.

†Ibid., p. 268.